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## Prevalence of Varicose Veins and Venous Anatomy in Patients Without Truncal Saphenous Reflux

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**Objectives.** To determine the prevalence and distribution of primary venous reflux in the lower limbs in patients without truncal saphenous reflux.

**Design.** Prospective cohort study.

**Patients and methods.** One thousand and seven hundred and twelve patients with suspected venous disease were examined by duplex ultrasonography. Seven hundred and thirty-five patients had primary varicose veins with competent saphenous trunks. Limbs with truncal saphenous reflux, deep vein reflux or obstruction, previous injection sclerotherapy or vein surgery, arterial disease and inflammation of non-venous origin were excluded from further consideration. The CEAP classification system was used for clinical staging. Systematic duplex ultrasound examination was undertaken to assess the distribution of incompetent saphenous tributaries.

**Results.** The prevalence of primary reflux with competent saphenous trunks was 43%. Reflux of GSV calf tributaries was the most common. The majority of the limbs (96%) belonged to chronic venous disease classes C1 and C2 of the CEAP classification.

**Conclusions.** Superficial venous reflux causing varicose veins in the presence competent saphenous trunks is very prevalent in this series in contrast to other studies, presumably reflecting differing patient populations. Our data clearly show that varicose veins may occur in any vein and do not depend on truncal saphenous incompetence. Careful duplex ultrasound evaluation allows the pattern of venous reflux to be established in this group of patient ensuring appropriate management of varices.

**Key Words:** Venous reflux; Duplex scanning; Saphenous vein; Varicose veins; Superficial tributary veins.

### Introduction

Primary superficial vein reflux is the most common haemodynamic abnormality in patients presenting with symptoms and signs of chronic venous disease (CVD) irrespective of its class.<sup>1,2</sup> Duplex scanning is the method of choice for evaluating the venous system in the lower limb size.<sup>3</sup> Few studies have been designed to investigate patterns of primary venous reflux in patients with competent saphenous trunks hence this particular study has been undertaken to determine the prevalence and distribution of this pattern of reflux. The aim of our investigation was to establish the extent of incompetent saphenous tribu-

aries in this group of patients in order to establish the most appropriate treatment.<sup>2,4,5</sup>

### Materials and Methods

Between January 2001 to August 2002, all patients referred to a private vascular ultrasound laboratory in the city of Maringá—Paraná, Brazil were prospectively entered into a customised database. A total of 1712 patients with suspected venous disease of the lower limb were investigated. The size of the sample is due to the laboratory being exclusive to patients with vascular conditions. From this group, 735 patients (43%) who had primary varicose veins and competent saphenous veins were included in the study. There were 69 men and 666 women aged between 16 and 75 years. On the basis of the clinical and duplex

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ultrasound examination patients were excluded from further study if they had superficial truncal saphenous incompetence, deep vein obstruction or sequelae, previous injection sclerotherapy or vein surgery, arterial disease or inflammation in the lower limb of non-venous origin.

Clinical evaluation of the patients was carried out by a physician specialising in vascular surgery and the CEAP<sup>6</sup> classification system was used for staging the clinical severity of CVD. They were classified as from C1 to C6 and all of patients belonged to class EpAs1, 5Pr.

The methods of examining superficial, perforator and deep veins have been previously described in the literature.<sup>7–10</sup> Imaging was performed using a Hewlett-Packard Image Point (Hewlett-Packard Co., Andover, MA) in B-mode and in colour duplex mode. All studies were performed by a physician specialising in vascular surgery and ultrasound. Scanning of the deep veins commenced with patients lying in 45° reverse Trendelenburg for investigation of the groin, medial thigh and leg. Veins in the popliteal fossa and calf were scanned with the patient in ventral decubitus position and the knees slightly flexed. B-mode imaging was used initially and the vessel evaluated by a compression manoeuvre to detect the possibility of thrombosis. The Valsalva manoeuvre was used to detect venous reflux in the proximal part of the limb. In the calf a manual compression-release manoeuvre of the limb approximately 10 cm below the vein under examination was used.

Next, with the patient stood on a step and used a handrail to steady himself. He took his weight on one leg whilst the other limb was examined for further evidence of venous reflux as described in the literature.<sup>7–11</sup> We investigated the main tributaries of saphenous veins paying special attention to any with reflux. To test for reflux, a distal manual compression-release technique was used. The duplex ultrasound was used in pulsed Doppler mode and the venous incompetence was defined as retrograde flow lasting for more than 0.5 s.<sup>12</sup>

The superficial veins were examined throughout their extent in both lower limbs. The perforating veins were examined and considered incompetent when they had a diameter of more than 3.5 mm and bi-directional flow or outward flow was present during a manual compression-release manoeuvre and this filled varicose veins.<sup>4,10,11</sup>

## Results

The total clinical series was 1712 patients with

suspected CVD investigated systematically by duplex ultrasonography. Primary varicose veins without incompetence of the great or small saphenous veins were present in 1063 limbs in 735 patients, corresponding to 43% of the patients (Table 1). The total number of incompetent saphenous tributaries and the number of incompetent veins per limb in the various clinical classes are shown in Table 2.

The incompetent veins were divided into GSV groin tributaries (263), GSV thigh tributaries (88), GSV calf tributaries (346) and SSV tributaries (280). The GSV groin tributaries were identified as external pudendal (25/263), superficial epigastric (18/263), anterior accessory saphenous (86/263) and medial accessory saphenous veins (134/263). Although the source of reflux could not be identified in 236 incompetent veins, they arose in the posterior thigh (45/236), medial thigh (54/236), lateral-posterior thigh (50/236) and lateral leg (26/236) (Table 3). The location of the incompetent perforators is shown in Table 4.

Dividing patients according to the CEAP clinical classification showed that there were 54.8% patients from class 1; 41% of the patients were from class 2; 3% from class 3 and 1.2% had skin changes [classes 4 (0.3%), 5 (0.3%) and 6 (0.6%)].

## Discussion

The local development of varicose veins in saphenous tributaries suggests that there are susceptible sites where wall changes, haemodynamic changes or both occur to initiate reflux.<sup>1</sup> The prevalence of tributary reflux with competent saphenous trunks in primary varicose veins (PVV) was 43%. This finding differs from those of other authors. Labropoulos *et al.* (1999)<sup>2</sup> in a similar study involving 860 patients found 9.7% and in another study<sup>5</sup> of 835 patients the prevalence was 10%. Jiang *et al.* (2001)<sup>4</sup> who carried out a study on veins in the groin involving 1072 patients found a 9.9% prevalence of which only 6.1% in PVV. In order to answer the question: 'Where does the reflux start?', Labropoulos *et al.* (1997)<sup>1</sup> studied 130 patients divided into three groups and found that the prevalence of superficial vein reflux which did not depend on GSV

**Table 1. Demographic data**

Class	1	2	3	4	5	6	Total
No. of patients	403	301	22	2	2	5	735
No. of limbs	560	453	35	4	2	9	1063
Right	281	232	19	2	1	5	540
Left	279	221	16	2	1	4	523
Male	20	42	4	1	0	2	69
Female	387	255	18	1	2	3	666

**Table 2. Total number of incompetent veins in the six CEAP clinical classes**

Clinical class	No. of incompetent veins	Veins per limb
C1	624	1.1
C2	711	1.6
C3	90	2.6
C4	24	6
C5	20	10
C6	31	6.2
Total	1482	1.4

incompetence was only 2.3% (only three patients presented with the condition). The high prevalence of tributary reflux with competent saphenous trunks in our study was due to the fact that the selected patients sent for pre-operative examination were referred to a private vascular ultrasound laboratory and did not originate from the public healthcare system. Patients included in our study were probably mainly concerned with the aesthetic aspects of the varicose veins rather than skin changes or other symptoms.

The prevalence of varicose veins arising from incompetent perforating veins in the calf was 17% and in the thigh was 1.3%. In another study<sup>10</sup> on isolated perforating vein reflux involving 78 patients with 500 perforators, the prevalence of such incompetent veins was 56.4%. The highest prevalence of varicose veins found in the present study was in the GSV tributaries including posterior arch vein as described in the literature.<sup>1,2</sup> GSV tributary reflux was more prevalent than SSV tributary reflux.

A more reliable evaluation of the number of affected tributaries per limb in relation to the clinical class was not possible due to the small number of patients belonging to classes 5 (only 2) and 6 (only 5) although this number rises significantly in more advanced clinical classes as described in the literature.<sup>2</sup> All patients in this study had reflux confined to tributaries alone. This is evidence that reflux can develop in the absence of saphenous junctions or saphenous trunk incompetence as described by Labropoulos *et al.* (1999).<sup>2</sup>

A number of other sources of venous reflux are

**Table 4. Number and site of incompetent perforator veins**

Site	Perforator veins	Number
Medial-anterior thigh	Hunter	10
Lateral thigh		1
Posterior thigh		7
Medial leg	Anterior malleolar line	10
	Cockett	76
	Sherman	30
	Boyd	21
Lateral leg	Anterior malleolar line	18
	Posterior malleolar line	16
	Bassi	8
Posterior leg	Midline	57
	Medial line	11
	Lateral line	3

described, e.g. epigastric reflux in the lower abdominal wall draining to the GSV. In primary veins such reflux is regarded as secondary to saphenous femoral (SF) incompetence. Pudendal vein reflux is almost exclusive to women, is not associated with post-thrombotic syndrome but is associated with pelvic congestion syndrome with ovarian or internal iliac vein reflux. Although it is well accepted that these non-SF patterns of reflux contribute to clinical varicose veins, it is doubtful whether such reflux significantly impairs venous function of the leg or contributes to the development of chronic venous insufficiency and leg ulcers.<sup>5</sup> In our series, we found 25 patients with pudendal vein reflux and only one had a leg ulcer, but two incompetent medial calf perforating veins were also present in this patient.

Our series includes a very large proportion of women (90.6%) and combined with the fact that most patients belong to C1 and C2 clinical classes suggests that the main motive for these patients seeking treatment was for cosmetic reasons. Labropoulos *et al.* (2001)<sup>5</sup> found that 70% of the women included in their study had venous disease and in 93% the GSV was competent. They consider that the tendency for the development of varices without saphenous truncal incompetence is due to physiologic factors exclusive to women, i.e. hormonal factors. Differences in the clinical class of reflux with or without competent GSV are evident and the contribution of non-SF reflux

**Table 3. Diameter and number of the incompetent tributary veins (the incompetent perforating veins have been excluded from this table)**

Incompetent veins	Diameter			Total veins
	<3.0 mm	3.1–4.0 mm	>4.0 mm	
GSV groin tributaries	131	71	61	263
GSV thigh tributaries	70	12	6	88
GSV calf tributaries	311	33	2	346
SSV tributaries	256	19	5	280
Unknown	180	38	18	236

to venous insufficiency is reflected by the apparent lack of serious clinical impact in the lower leg.<sup>4</sup> Although 80% of the patients are symptomatic<sup>5</sup> in the absence of GSV involvement the venous disease is less clinically advanced. Ninety six percent of our patients had no symptom attributable to their venous disease.

Clinical assessment and physiologic tests by themselves cannot determine the distribution and extent of reflux particularly when the GSV and SSV are deeply located and are usually not visible. The most important determinant of success, however, is the correct diagnosis of the non-SF reflux and identification of the specific type. This can only be done adequately by careful clinical assessment followed by duplex scanning prior to deciding on the treatment plan. This is especially true in patients with a competent GSV trunk, which need not be ligated or stripped. In symptomatic patients, distinguishing the true anatomic site of reflux is necessary to facilitate appropriate and effective treatment. The effective method of treatment in our country is the resection of the incompetent vessels.<sup>2,4,5</sup>

Superficial venous reflux with competent saphenous trunks is very prevalent in our study. These occur most frequently in GSV or SSV tributaries. Given that this reflux has arisen in the presence of competent deep veins and superficial saphenous trunks, it can be deduced that reflux can occur in any vein and does not depend on truncal vein incompetence. Most of our patients are female and the presence of incompetent saphenous tributaries causes mainly cosmetic problems with patients in CEAP classes C1 and C2. The diagnosis obtained by colour duplex ultrasonography is very important in identifying the patterns of reflux and determining the appropriate treatment for each case, sparing the competent venous trunks.

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